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(54) A METHOD FOR THE MANUFACTURING OF AN ABSORBENT STRUCTURE AND AN ABSORBENT ARTICLE COMPRISING AN ABSORBENT STRUCTURE MANUFACTURED ACCORDING TO THIS METHOD

VERFAHREN ZUM HERSTELLEN EINER ABSORBIERENDEN STRUKTUR SOWIE ABSORBIERENDER ARTIKEL MIT EINER GEMäSS DIESEM VERFAHREN HERGESTELLTEN STRUKTUR

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Description

Background

[0001] The present invention relates to a method for manufacturing of an absorbent structure in an absorbent article, such as a sanitary napkin, a tampon, a panty protector, an incontinence guard, a diaper, a wound or sore dressing, a saliva absorbent and like articles. It also relates to the structure produced by the method, to an absorbent article comprising such a structure and to the use of a web produced by the method in absorbent structures.

[0002] Many different types of absorbent articles of this kind are known to the art. The absorbent bodies of such articles are typically produced by dry-defibering and fluffing cellulose pulp in roll, bale or sheet form for instance, to form a pulp mat, sometimes admixed with so-called superabsorbent material in the pulp mat, these absorbents being polymers which are capable of absorbing many times their own weight of water or body fluid.

[0003] The pulp body is often compressed so as to enhance its fluid-wicking ability and also in order to reduce pulp body bulk and therewith obtain an article which is as compact as possible.

[0004] The absorbent body may also include other constituents, for instance constituents which will improve its fluid-acquisition properties or its fluid-wicking properties, or which will increase its coherent strength, i.e. its coherency, and its ability to withstand deformation in use.

[0005] One serious drawback with products of this nature is found in the total absorption capacity of the articles and also in the fact that the articles will often leak long before their total absorption capacity has been fully utilized. Among other things, this is because the body fluid discharged by the wearer is unable to penetrate into the absorption material and to spread to hitherto unused areas of the article quickly enough, but instead leaks from the sides of the sanitary napkin, the diaper or the incontinence guard. The ability of the materials used in the article to disperse the absorbed fluid throughout the entire absorbent body is thus highly important.

[0006] Another problem resides in so-called rewetting, i.e. the transference of body fluid that has already been absorbed back into contact with the wearer's skin as a result of external forces, for instance when the wearer sits down. It is generally desired that the surface of the article that lies proximal to the wearer in use will remain as dry as possible.

[0007] Another desideratum with regard to the majority of hygiene products is that the article shall be thin, so that it can be worn as discretely as possible.

[0008] A very large part of the production plants used in the manufacture of the aforesaid hygiene articles is comprised of defibrating equipment, pneumatic conveying systems and mat-forming equipment. This equipment is also the source of serious faults in the production plants. Equipment for compressing the finished pulp mat or the finished hygiene product is furthermore often included downstream of the production plants.

[0009] A separate problem is related to the use of superabsorbent material in absorbent articles. The superabsorbent material is normally available in the form of granules, which are difficult to bind to the absorbent structure.

[0010] It is known from International Patent Application WO 90/05808 to produce a pulp web by dry-forming, which is later defibered, so-called dry-formed roll or reel pulp. Flash-dried paper-pulp fibres, which may consist of thermomechanical pulp, chemi-thermomechanical pulp, CTMP, or chemical paper pulp, sulphite or sulphate pulp with a dry solids content of about 80% is delivered by means of an air stream in a controlled flow to a forming head arranged above a forming wire and there formed into a web that has a weight per unit area of 300-1500 g/m^2 and a density of 550-1000 kg/m^3. Air is sucked away through a suction box placed beneath the wire. The moisture content in the process shall be 5-30%.

[0011] The web is pre-pressed to a density of 550-1000 kg/m^3 in order to slightly reduce the bulk of the web prior to the final pressing stage. The pressed web has a mechanical strength which enables the web to be rolled-up or handled in sheet form for storage and transportation purposes. The web can be readily defibered and is intended to be converted into fluff for use in the manufacture of absorbent bodies or pads for diapers, sanitary napkins and like articles.

[0012] Another method for the manufacturing of an absorbent structure is described in European Patent 0 122 042, where a mixture of hydrophilic fibres and water insoluble particles of insoluble hydrogel is airlaid into a web and compressed to a density of 0.15 to about 1.0 g/cm3. This method however comprises several production steps, where the dry lap base material is first disintegrated into cellulose fibres by use of a hammer mill, whereafter the fibres are deposited on a screen surface and formed to the absorbent structure, which is then compressed. These manufacturing steps make this process rather complicated and expensive.

Summary of the Invention

[0013] The object of the present invention is to provide in an absorbent article of the aforedescribed kind an absorbent structure which exhibits extremely good absorption properties, both with respect to its ability to quickly take up fluid and also with respect to its ability to spread fluid throughout the material. The material will preferably exhibit low rewetting tendencies as well as being capable of being made very thin. It is also desired to provide a simplified method of manufacturing absorb-

ent articles of the kind defined in the introduction. These objects and desiderata are achieved with a manufacturing method in which particulate material comprising 30-100%, preferably at least 50% and most preferably at least 70% flash-dried cellulose fibres is dry-formed to a web with a weight per unit area of between 50-1500 g/m2 and compressed to a web density of between 0.2-0.8 g/cm3 and where the web without subsequent defibration and fluffing is incorporated as an absorbent structure in an absorbent article.

[0014] Non-defibered, dry-formed roll pulp has been found to be an extremely good absorption material and can be used directly as an absorbent material in hygiene articles, without being defibered. The material also has good fluid wicking properties and swelling properties, which are meaningful to the function of the product. The pulp mat is very thin and therefore need not be further compressed in the product or article.

[0015] In the case of certain product applications in hygiene articles, it is convenient to soften dry-formed roll pulp prior to its use as an absorption material. The earlier mentioned good absorption properties, fluid wicking properties and swelling properties are not influenced by the softening process to any great extent. One method to soften an absorbent sheet is described in European Patent Application EP 0 360 472, where the compressed absorbent material is worked between partially cutting rollers and thereby gaining softness. This method however leads among other things to decreased strength in the softened material.

Brief Description of the Drawings

[0016] The invention will now be described in more detail with reference to a number of exemplifying embodiments thereof and also with reference to the accompanying drawings, in which:

Figure 1 illustrates the absorption properties of a dry-formed CTMP-material subsequent to being worked between rolls at different roll spacings. Conventionally formed and compressed pulp mats of CTMP-pulp and chemical pulp respectively were used as references.

Figure 2 illustrates the absorption properties of a dry-formed CTMP-material subsequent to being softened. Conventionally formed and compressed mats comprised of CTMP-pulp and chemical pulp respectively were used as references.

Figure 3 illustrates the absorption properties of a complete absorbent article manufactured with dry-formed CTMP in the core. Conventionally manufactured products of corresponding compositions were used as references.

Figure 4 illustrates the fluid acquisition time of a complete absorbent article produced with dry-formed CTMP in the core. Conventionally manufactured products of corresponding compositions were used as references.

Figure 5 illustrates the degree of utilization of a complete absorbent article produced with dry-formed CTMP in the core. Conventionally manufactured products of corresponding compositions were used as references.

Figure 6 illustrates the absorption properties of an absorbent structure produced with dry-formed CTMP, both with and without a superabsorbent admixture. Conventionally manufactured pulp cores both with and without a superabsorbent admixture were used as references.

Figure 7 illustrates rewetting of a complete absorbent article produced with dry-formed CTMP in the core. Conventionally manufactured products of corresponding compositions were used as references.

Figure 8 illustrates the respective rewetting of an unsoftened and a softened absorbent structure in connection with blood absorption which was produced with dry-formed CTMP in the core, both with and without a superabsorbent admixture.

Figure 9 illustrates rewetting of a complete absorbent article in connection with blood absorption which was produced from dry-formed CTMP in the core. Conventionally manufactured products of corresponding composition were used as references.

Figures 10-11 illustrate schematically the composition of various exemplifying embodiments of inventive absorbent articles.

Figure 12 illustrates the structure of a cross section of the material in unsoftened condition.

Figure 13 illustrates the structure of a cross section of the material in softened condition.

Description of the Invention

[0017] As before mentioned, important properties of a material used in the manufacture of a hygiene article are its absorbent capacity, absorption rate, wicking capacity, drainage capacity, retention capacity, rewetting, softness and smoothness.

[0018] The fluids concerned are urine, menstruation blood, blood, fluid matter from wounds and sores, rinsing fluid and saliva.

[0019] The object of the present invention is to provide in an absorbent article, such as a sanitary napkin, tampon, panty protector, incontinence guard, diaper, bed

protector, wound or sore dressing, saliva absorbent and like articles, an absorbent structure which exhibits highly effective absorption properties, especially with regard to its fluid-acquisition rate and its ability to wick fluid throughout the material. The material will also preferably have low rewetting and be capable of being made very thin and smooth. It is also desired to simplify the manufacturing process. A finished absorbent material in roll form which can be used without needing to be defibered would partially reduce the need for the earlier mentioned defibering equipment, pneumatic conveying systems and mat-forming equipment, and consequently there is a demand for such material.

[0020] The aforesaid objects and desiderata have been achieved in accordance with the invention by using a manufacturing method in which particulate material comprising 30-100%, preferably at least 50% and most preferably at least 70% flash-dried cellulose fibres is dry-formed to a web with a weight per unit area of between 50-1500 g/m2 and compressed to a web density of between 0.2-0.8 g/cm3 and where the web without subsequent defibration and fluffing is incorporated as an absorbent structure in an absorbent article.

[0021] In accordance with the invention, there is used a dry-formed product which is manufactured from particulate material as mechanical pulp or chemi-thermomechanical pulp (CTMP) or a corresponding product manufactured from sulphite pulp or sulphate pulp, so-called chemical cellulose pulp. Cellulose fibres which have been stiffened chemically may also be used. In the dry-formed product can also be included other particulate matter as superabsorbents, thermoplastic binding fibres and other kind of fibres.

[0022] Non-treated dry-formed roll pulp has extremely good absorption, wicking and swelling properties, and it has been found possible to use the material immediately as an absorption material in hygiene articles without defibrating the pulp. In the case of certain absorbent articles, it has been found suitable to soften the material slightly prior to its use. One method of softening the material is described below.

[0023] Dry-formed roll pulp has a good integrity which means that in the case of use of superabsorbent materials in dry-formed roll pulp the granules will be well bound to the absorbent structure and will not spread during further conversion into absorbent hygiene products.

[0024] Dry-formed cellulose pulp can be produced, for instance, by forming a web of flash-dried paper pulp fibres in accordance with the method described in International Patent Application WO 90/05808.

[0025] Cellulose pulp fibres have a so-called curl value which defines the crookedness of the fibre. Curl value can be measured according to the method described by B.D. Jordan, N.G. Nguyen in Papper och Trä 4/1986, page 313.

Softening of the Material

[0026] The material can be given a softness which renders the material highly suitable for use as an absorption material in the majority of hygiene articles, by working dry-formed roll pulp between for instance corrugated rolls. The material can be brought to different degrees of softness for different product applications, by working the material between different types of rolls and at different roll spacings.

[0027] Dry-formed roll pulp which has been softened in this way exhibits very good product properties, and the earlier mentioned good absorption properties are not influenced by the softening process to any great extent.

[0028] The material is delaminated in the softening process as illustrated in figures 12 and 13. The unsoftened material 61 has normally an even high density throughout the whole of the thickness of the material. As a result of the softening process the material is delaminated so as to form a plurality of thin fibre layers 62 partially separated by spacer 63. Softening and delamination of the material reduces its total density to some extent, although the original web density is essentially retained in each individual layer. Because a very high density is retained in the individual layers, the good fluid wicking properties of the material are retained despite the increase in bulk obtained in conjunction with the softening process. The total bulk is increased by up to 300%, normally 1-100%, as a result of the softening process, depending on the method used and the extent to which the material is softened.

[0029] It will be understood that the aforesaid material softening method has been given solely by way of example and that corresponding results can be achieved with the aid of other methods. For instance, the material could possibly be softened by means of ultrasonic energy, microwaves, by moisturizing the material, or with the aid of chemical additives.

Investigation of Material Properties

[0030] The test equipment described below was used to evaluate absorption properties.

Method 1. Absorption Properties Up an Inclined Plane

[0031] A rectangular test body was punched from the material and a line was drawn transversely across the test body at a point 11 cm from one short end of the body. A fluid container was placed adjacent laboratory scales and both the scales and the container were adjusted to a horizontal position. A plexiglass plate was placed on the scales at a 30° slope, with one free edge of the plate extending slightly down into the container. A line had been drawn transversely across the plate at a point 11 cm from the lower edge of said plate. Test fluid (0.9% NaCl-solution) was poured into the container,

until 20 mm of the plexiglass plate was located beneath the surface of the fluid. The test body was secured on the plexiglass plate so that the line drawn on the test body coincided with the line drawn on the plate while, at the same time, folding away the lower part of the test body so as to prevent it from coming into contact with the test liquid. A clock was started at the same time as the test body was laid onto the plate, with the test body extended down into the solution to the same extent as the plate. The increase in weight of the test body with time was recorded.

Method 2. Measurements of Absorption Capacity and Degree of Utilization

[0032] A test product was secured in a fixture. Test fluid (0.9% NaCl-solution) was delivered to the wetting point of the product over a period of 60 minutes at the rate at which the fluid was absorbed. The amount of fluid absorbed was measured continuously and the total amount of fluid absorbed by the product constitutes the utilized absorption capacity of the test product. The test product was then placed in a fluid bath, in which it had the maximum opportunity of absorbing test fluid. The test product was then again weighed and the total absorption capacity calculated. The degree of utilization is given by the quotient between the utilized absorption capacity of the test product and the total absorption capacity.

Method 3. Measurements of Rewetting, Fluid Wicking and Acquisition Time

[0033] Four batches of sample fluid (0.9% NaCl-solution), each comprising 28 ml, were delivered at 20-minute intervals. The time measurement was continued until all fluid had been absorbed. The extent to which the fluid had dispersed in the diaper was noted after each batch. Subsequent to delivering the last batch of fluid, filter paper was placed over the wetting point and loaded with a weight of 1.1 kg for 15 seconds. The filter paper was weighed both before and after applying the load and rewetting was recorded.

Method 4. Determining Rewetting Measurements

[0034] A diaper intended for a given weight range was weighed and then placed on a flat support surface. An adapted quantity of test fluid (0.9% NaCl-solution, 100 ml for a diaper intended for a weight range of 7-15 kg) was delivered to the wetting point of the diaper. A further 100 ml of fluid was delivered after 20 minutes. When all fluid had been absorbed, a filter paper was placed over the wetting point and loaded with a weight of 1.1 kg for 15 seconds. The filter paper was weighed both before and after applying the load and the result was recorded as a first rewetting instance. After a further 20 minutes, another 100 ml of fluid was delivered and when all fluid had been absorbed, the procedure was repeated with a fresh filter paper and the result recorded as a second rewetting instance.

Method 5. Determining Blood Absorption

[0035] A test body, 65 x 200 mm, was punched from the material. 5 ml test fluid (0.9% NaCl-solution) were delivered to the wetting point on the test body. Dispersion of the fluid was measured after about 30 minutes. A further 5 ml of test fluid (0.9% NaCl-solution) were then delivered to the wetting point and fluid dispersion was measured after about a further 30 minutes. Subsequent to the last delivery, eight filter papers were placed over the wetting point and loaded with a weight of 4.875 kg for 15 seconds. The filter papers were weighed both before and after applying the load and rewetting was recorded.

Test Results

Softening

[0036] With the intention of investigating how the material was affected at different softening roll spacings when softening the material, a material was tested under different softening conditions. For instance, in the case of a dry-formed CTMP-material having a weight per unit area of 900 g/m^2 and a density of 0.63 g/cm^3, a suitable roll spacing is 1.7-2.4 mm during the softening process. The material is not influenced to any great extent at roll spacings which lie within this range. Figure 1 illustrates the absorption properties at different roll spacings. The results were determined in accordance with Method 1.

- A Material according to the invention, roll spacing 1.7 mm.
- B Material according to the invention, roll spacing 2.0 mm.
- C Material according to the invention, roll spacing 2.4 mm.
- D Material according to the invention, roll spacing 2.0 mm, softened twice.
- E Material according to the invention, roll spacing 2.0 mm, softened four times.
- F CTMP-pulp, density 0.125 g/cm^3.
- G Chemical sulphate pulp, density 0.125 g/cm^3.

Absorption Properties of Absorbent Structures

[0037] The absorption properties of an inventive CTMP-material having a weight per unit area of 900 g/m^2 and a density of 0.63 g/cm^3 compared with those of corresponding pulp cores produced from conventionally defibred and web-formed CTMP and corresponding chemical pulp are shown in Figure 2. In the absence of superabsorbent material, the absorption capacity is

about 9 g of fluid for each gram of absorbent material. The results were determined in accordance with Method 1.

A Material according to the invention.
B CTMP-pulp, density 0.125 g/cm^3.
C Chemical sulphate pulp, density 0.125 g/cm^3.

Product Properties of a Complete Absorbent Article

[0038] With the intention of studying other properties of complete absorbent articles, test products were prepared in the form of conventional children's diapers which comprised a T-shaped absorbent body (T-core), which lies nearest the wearer, and a rectangular absorbent body (R-core) which lies beneath the T-core, where the rectangular absorbent body in the test products was produced from an inventive CTMP-material. In the conventional products, the T-shaped absorbent body (T-core) and the rectangular absorbent body (R-core) were comprised of conventional defibred CTMP and chemical pulp.

Measurements of the Absorption Capacity

[0039] Products which comprised an inventive CTMP-material exhibited an absorption in grams which was equivalent to the reference products which had corresponding pulp cores that were comprised of conventionally defibred and mat-formed CTMP and chemical pulp. The results are set forth in Figure 3. The results were determined in accordance with Method 2.

A Reference diaper Libero Girl.
B Reference diaper Libero Boy.
C Child diaper comprising inventive material.

Measurements of Fluid Acquisition Time

[0040] Products in which the R-core comprised an inventive CTMP-material exhibited a shorter fluid acquisition time than the reference product. This implies that an R-core which contains inventive CTMP-material is able to drain the T-core more effectively. The results can be seen from Figure 4. The results were determined in accordance with Method 3.

A Reference diaper Libero Girl.
B Reference diaper Libero Boy.
C Child diaper comprising inventive material.

Measurements of the Utilization of the Absorbent Body

[0041] A comparison between the degree of utilization of the absorbent body in an absorbent article which contained an inventive CTMP-material and a corresponding absorbent article which contained conventional CTMP and chemical pulp showed that the degree of utilization is about the same, although slightly on the plus side for an inventive CTMP-material. The results can be seen from Figure 5. The results were determined in accordance with Method 2.

A Reference diaper Libero Girl.
B Reference diaper Libero Boy.
C Child diaper comprising inventive material.

Admixing Superabsorbent Material

[0042] The presence of superabsorbent material in an absorbent body will influence the absorption properties of the body. Superabsorbent material can be incorporated in the absorbent body in different ways. For instance it may be admixed with the body material, laid in layers in the body, or disposed therein in some other way. This admixture of superabsorbent material can be effected in conjunction with manufacturing the dry-formed material, although it may also be effected during some other part of the manufacturing process. The absorption properties were compared with an inventive CTMP-material to which no superabsorbent material had been added and also with corresponding pulp cores comprised of conventional defibred CTMP and chemical pulp. The results of this comparison are shown in Figure 6. The results were determined in accordance with Method 1.

A Chemical sulphate pulp containing 30% superabsorbent and having a density of 0.125 g/cm^3.
B Inventive material containing 30% superabsorbent.
C Reference diaper containing 30% superabsorbent.
D Inventive material containing no superabsorbent.

Rewetting Measurements

[0043] Products which comprised an inventive CTMP-material in the R-core exhibited better rewetting values than the reference product. This also implies that an R-core which contains inventive CTMP-material is able to drain the T-core more effectively. The results can be seen from Figure 7. The results were determined in accordance with Method 4.

A Reference diaper Libero Girl.
B Reference diaper Libero Boy.
C Child diaper comprising inventive material.

Rewetting Measurements, Specific for Blood Absorption

[0044] In the case of blood absorption, products which comprised an inventive softened CTMP-material showed better rewetting values than non-softened products. The results also showed that when absorbing blood, products which lacked superabsorbent material

exhibited lower rewetting values than material which contained superabsorbent material. Material which lacks superabsorbent material also disperses blood much more effectively. The results can be seen from Figures 8 and 9. The reference products comprised two different products frequently found on the market. The results were determined in accordance with Method 5. The prerequisites for this effect are that at least one layer of the pulp mat is free from superabsorbent material. Of course, this does not exclude the presence of such material in other parts of the absorbent article.

Figure 8

[0045]

A Inventive material 350 g/m2.
B Inventive material 350 g/m2, softened.
C Inventive material 350 g/m2 + 5% superabsorbent.
D Inventive material 350 g/m2 + 5% superabsorbent, softened.

Figure 9

[0046]

A Reference product 1.
B Reference product 2.
C Product containing inventive material.

Network Strength

[0047] Dry-formed roll pulp will normally have sufficient mat strength for the product applications intended here. If the network strength of certain product applications should be found insufficient, the network strength can be increased by reinforcing the structure in some suitable manner, by adding reinforcing fibres, binding fibres or binding agent to the cellulose fibre mixture. The network strength can also be increased by incorporating a reinforcing layer of, for instance, plastic, non-woven, net or threads in the absorbent structure, or by fastening a reinforcing layer or an outer sheet on one or both sides of the material.

Density and Weight per Unit Area

[0048] The softened pulp mat is still very thin, and consequently it is unnecessary in many cases to further compress the mat prior to its use in an absorbent article. A suitable density is 0.2-0.8 g/cm^3, preferably 0.25-0.7 g/cm^3 and most preferably 0.3-0.6 g/cm^3. A suitable weight per unit area between 50-1500 g/m^2, preferably 80-1000 g/m^2 and most preferably 100-800 g/cm^2. When calculating the density, the thickness of the material was measured with the aid of a Mitutoyo thickness meter.

Description of a First Exemplifying Embodiment

[0049] Figure 10 illustrates a diaper constructed in accordance with one embodiment of the invention. The diaper includes, in a conventional manner, an absorbent body 11 which is enclosed between a fluid-permeable top sheet 12, which conveniently comprises a soft non-woven material, a perforated plastic film or the like and which is intended to lie proximal to the wearer in use, and a fluid-impermeable bottom sheet 13. The sheets 12 and 13 have parts which extend beyond the absorbent body 11 and the sheets are joined together at these protruding parts. The bottom sheet 13 is comprised of a suitable plastic material, for instance polyethylene. It will be understood, however, that other known materials can be used for the top and bottom sheets, within the scope of the invention.

[0050] The absorbent body is comprised of two or more layers, an upper fluid acquisition layer 14 and one or two lower wicking layers and storage layers 15 and 16. The inventive material is used mainly as an acquisition layer 14. Those layers in which inventive material is not used may be comprised of other types of materials, for instance conventional cellulose fibre material.

[0051] The purpose of the acquisition layer 14 is to rapidly take-up a given quantity of fluid. This fluid shall solely be held loosely in the fibre structure and quickly drained therefrom. The acquisition layer 14 is comprised of dry-formed material in accordance with the invention and has a relatively open fibre structure of relatively low density and contains 0-10% superabsorbent material. The superabsorbent material used in the acquisition layer 14 will preferably have a high gel strength, so that an open three-dimensional fibre structure will be retained in this layer after becoming wet. A suitable density range for the acquisition layer 14 is 0.20-0.70 g/cm^3. A suitable weight per unit area range for the acquisition layer 14 is 80-1000 g/m^2.

[0052] The main purpose of the wicking layer 15 is to transport the fluid received in the acquisition layer 14 effectively to the storage layer 16 located beneath the wicking layer 15 and to ensure that the greatest possible part of the storage layer 16 is utilized for absorption purposes. The wicking layer 15 may be comprised of different types of materials, and has a relatively low superabsorbent content.

[0053] The purpose of the storage layer 16 is to absorb and bind the fluid which is dispersed to the storage layer 16 through the wicking layer 15. The storage layer 16 may be comprised of different types of materials and has a relatively high superabsorbent content.

[0054] The wicking layer 15 and the storage layer 16 may optionally be combined to form a single layer. In this case, the single layer will have a relatively high superabsorbent content and a relatively high density.

[0055] When the wicking layer 15 and the storage layer 16 are combined in a single layer, the superabsorbent content of the layer can be varied throughout

the product, so as to obtain a superabsorbent gradient in the depth, length and/or the breadth direction of the product

[0056] The various layers may have different forms and sizes. Normally, the absorbent structure is combined with some form of elastication, inter alia in the crotch region of the product, in order to improve product efficiency.

Description of a Second Exemplifying Embodiment

[0057] Figure 11 illustrates an exemplifying embodiment of an inventive wound or sore dressing. The dressing includes, in a conventional manner, an absorbent body 41 which is enclosed between a fluid-permeable top sheet 42, which is suitably comprised of a soft non-woven material, a perforated plastic film or the like, and which is intended to lie proximal to the wearer in use, and a fluid-repellent bottom sheet 43. The sheets 42 and 43 have parts which protrude beyond the absorbent body 41 and are joined together at these protruding parts. The bottom sheet 43 is comprised of a suitable fluid-repellent material, for instance a non-woven material that has been made hydrophobic. It will be understood, however, that the top and bottom sheets may comprise other known materials, within the scope of the invention.

[0058] The absorbent body 41 is comprised of only one single layer. This layer may consist of inventive dry-formed material and may be constructed with a relatively open fibre structure of relatively low density and with a superabsorbent content of 0-10%. A suitable density range in respect of the absorbent body 41 is 0.20-0.50 g/cm^3 and a suitable weight per unit area is 200-700 g/m^2.

[0059] It will be understood that the invention is not restricted to the illustrated and described exemplifying embodiments thereof and that other embodiments are conceivable within the scope of the following Claims.

Claims

1. A method for the manufacturing of an absorbent structure (11,41) in an absorbent article, such as a diaper, sanitary napkin, tampon, panty protector, incontinence guard, bed protector, wound or sore dressing, saliva absorbent and like articles, wherein particulate material comprising 30-100%, preferably at least 50% and most preferably at least 70% cellulose fibres is dry-formed to a web (14,15,16,41) that is compressed to a web density of between 0.2-0.8 g/cm^3, **characterized in** that the cellulose fibres used have been flash-dried; the web (14,15,16, 41) is dry-formed to a web with a weight per unit area of between 50-1500 g/m^2; and in that the web without subsequent defibration and fluffing is incorporated as an absorbent structure in an absorbent article.

2. A method for the manufacturing of an absorbent structure (11,41) according to Claim 1, **characterized in** that said web (14,15,16,41) is compressed to a web density of between 0.25-0.70 g/cm^3, preferably 0.3-0.6 g/cm^3.

3. A method for the manufacturing of an absorbent structure (11,41) according to any of the preceding Claims, **characterized in** that the web (14,15,16,41) before being incorporated as an absorbent structure in an absorbent article is mechanically softened and therewith delaminated, so as to exhibit a plurality of partially separated thin fibre layers (62), which in themselves exhibit a density which corresponds to the web density.

4. An absorbent structure (11,41) for an absorbent article, such as a diaper, sanitary napkin, tampon, panty protector, incontinence guard, bed protector, wound or sore dressing, saliva absorbent and like articles, the structure having been manufactured according to the method claimed in one, or more of Claims 1-3 and comprising particulate material containing 30-100%, preferably at least 50% and most preferably at least 70% cellulose fibres dry-formed to a web (14,15,16,41) and compressed to a web density of between 0.2-0.8 g/cm^3, **characterized in** the cellulose fibres used having been flash-dried; and the web having been dry-formed to a web with a weight per unit area of between 50-1500 g/m^2 and having been compressed without any subsequent defibration and fluffing.

5. An absorbent structure (11,41) according to Claim 4, **characterized in** that the weight per unit area of the structure (11,41) is between 80-1000 g/m^2, preferably 100-800 g/m^2.

6. An absorbent structure (11,41) according to Claims 4 or 5, **characterized in** that the cellulose fibres are mainly comprised of fibres of chemi-thermomechanically produced pulp.

7. An absorbent structure (11,41) according to Claim 6, **characterized in** that the chemi-thermomechanical pulp fibres have a curl value of between 0.20 and 0.40.

8. An absorbent structure (11,41) according to any of Claims 4-7, **characterized in** that at least a portion of the fibres are chemically stiffened cellulose fibres.

9. An absorbent structure (11,41) according to any of Claims 4-8, **characterized in** that the structure (11,41) includes between 0-20% superabsorbent material, preferably between 0.5-10%, and most preferably 1-5%, calculated on the total weight of

the struture in a dry state.

10. An absorbent structure (11,41) according to any of the Claims 4-9, **characterized in** that the structure (11,41) includes reinforcing means, for instance binding agent, reinforcing fibres or thermoplastic binding fibres.

11. An absorbent article such as a diaper, sanitary napkin, panty protector, incontinence guard, bed protector, wound or sore dressing, saliva absorbent and like articles comprising a liquid-permeable top sheet (12,42), an essentially liquid-impermeable bottom sheet (13,43), and an absorbent body enclosed between said sheets, **characterized in** that the absorbent body includes an absorbent structure (11,41) according to any of Claims 4-10.

12. An absorbent article according to Claim 11, in which the absorbent body includes at least two layers, an acquisition layer (14) and one or more wicking and/or storage layers (15,16), wherein the acquisition layer (14) is intended to quickly take up and deliver fluid to the wicking (15) and/or storage (16) layer or layers, **characterized in** that the acquisition layer (14) comprises an absorbent structure (11,41) according to Claim 4.

13. An absorbent article according to Claim 12, **characterized in** that the cellulose fibres in the acquisition layer (14) are comprised mainly of fibres of chemi-thermomechanically produced pulp.

14. An absorbent article according to Claim 13, **characterized in** that the absorbent structure (11,41) in the acquisition layer (14) is covered with a layer of chemical pulp on one side thereof.

15. An absorbent article according to any of Claims 12-14, **characterized in** that at least a portion of the cellulose fibres in the acquisition layer (14) are chemically stiffened cellulose fibres.

16. An absorbent article according to any of Claims 12-15, **characterized in** that the density of the acquisition layer (14) is between 0.25-0.70 g/cm^3, preferably between 0.30-0.60 g/cm^3.

17. The use, in absorbent structures (11, 41) incorporated in absorbent articles, such as diapers, sanitary napkins, tampons, panty protectors, incontinence guards, bed protectors, wound or sore dressings, saliva absorbents and like articles, of a web (14,15,16,41) dry-formed of particulate material comprising 30-100%, preferably at least 50% and most preferably at least 70% cellulose fibres and compressed to a web density of 0.2-0.8 g/cm^3, **characterized in** that the cellulose fibres used have been flash-dried; and that the web has been dry-formed to a web with a weight per unit area of 50-1500 g/m^2; without any subsequent defibration and fluffing of the web.

Patentansprüche

1. Verfahren zur Herstellung einer absorbierenden Struktur (11, 41) in einem absorbierenden Artikel, wie beispielsweise eine Windel, eine Hygienebinde, ein Tampon, ein Höschenschutz, ein Inkontinenzschutz, ein Bettenschutz, ein Wundverband, ein Speichelabsorbens und ähnliche Artikel, bei dem ein Partikelmaterial mit 30-100%, vorzugsweise wenigstens 50% und am bevorzugsten wenigstens 70% Zellulosefasern zu einer Bahn (14, 15, 16, 41) trockengeformt wird, die auf eine Bahndichte zwischen 0,2-0,8 g/cm^3 zusammengedrückt wird, **dadurch gekennzeichnet, dass** die verwendeten Zellulosefasern schnellgetrocknet wurden, die Bahn (14, 15,16, 41) zu einer Bahn mit einem Flächengewicht zwischen 50-1500 g/m^2 trockengeformt wird und dass die Bahn ohne nachfolgende Defibration und Fluffen (fluffing) als absorbierende Struktur in einem absorbierenden Artikel eingegliedert wird.

2. Verfahren zur Herstellung einer absorbierenden Struktur (11, 41) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Bahn (14, 15, 16, 41) auf eine Bahndichte zwischen 0,25-0,70 g/cm^3, vorzugsweise 0,3-0,6 g/cm^3 zusammengedrückt wird.

3. Verfahren zur Herstellung einer absorbierenden Struktur (11, 41) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass**, bevor die Bahn als absorbierende Struktur in einen absorbierenden Artikel eingegliedert wird, mechanisch erweicht und hierbei delaminiert wird, um so mehrere teilweise separierte dünne Faserschichten (62) auszubilden, die in sich selbst eine Dichte aufweisen, die der Bahndichte entspricht.

4. Absorbierende Struktur (11, 41) für einen absorbierenden Artikel, wie beispielsweise eine Windel, eine Hygienebinde, ein Tampon, ein Höschenschutz, ein Inkontinenzschutz, ein Bettenschutz, ein Wundverband, ein Speichelabsorbens und ähnliche Artikel, wobei die Struktur gemäß dem Verfahren nach einem oder mehreren der Ansprüche 1-3 hergestellt wurde und Partikelmaterial umfasst, das 30-100%, vorzugsweise wenigstens 50% und am bevorzugsten wenigstens 70% Zellulosefasern enthält, die zu einer Bahn (14, 15, 16, 41) trockengeformt und auf eine Bahndichte zwischen 0,2-0,8 g/cm^3 zusammengedrückt sind, **dadurch gekennzeichnet, dass** die verwendeten Zellulosefasern

schnellgetrocknet wurden und die Bahn zu einer Bahn mit einem Flächengewicht zwischen 50-1500 g/m^2 trockengeformt wurde und die Bahn ohne nachfolgende Defibration und Fluffen (fluffing) zusammengedrückt wurde.

5. Absorbierende Struktur (11, 41) nach Anspruch 4, **dadurch gekennzeichnet, dass** das Flächengewicht der Struktur (11, 41) zwischen 80-1000 g/m^2, vorzugsweise 100-800 g/m^2 beträgt.

6. Absorbierende Struktur (11, 41) nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** die Zellulosefasern hauptsächlich aus Fasern aus chemithermomechanisch hergestelltem Zellstoff bestehen.

7. Absorbierende Struktur (11, 41) nach Anspruch 6, **dadurch gekennzeichnet, dass** die chemithermomechanisch hergestellten Zellstofffasern einen Curl-Wert zwischen 0,20 und 0,40 haben.

8. Absorbierende Struktur (11, 41) nach einem der Ansprüche 4-7, **dadurch gekennzeichnet, dass** zumindest ein Teil der Fasern chemisch versteifte Zellulosefasern sind.

9. Absorbierende Struktur (11, 41) nach einem der Ansprüche 4-8, **dadurch gekennzeichnet, dass** die Struktur (11, 41) zwischen 0-20%, vorzugsweise zwischen 0,5-10% und am bevorzugsten 1-5% Superabsorbensmaterial enthält, berechnet vom Gesamtgewicht der Struktur in trockenem Zustand.

10. Absorbierende Struktur (11, 41) nach einem der Ansprüche 4-9, **dadurch gekennzeichnet, dass** die Struktur (11, 41) Verstärkungsmittel, beispielsweise Bindemittel, Verstärkungsfasern oder thermoplastische Bindefasern, enthält.

11. Absorbierender Artikel, wie beispielsweise eine Windel, eine Hygienebinde, ein Höschenschutz, ein Inkontinenzschutz, ein Bettenschutz, ein Wundverband, ein Speichelabsorbens und ähnliche Artikel, mit einer flüssigkeitsdurchlässigen Decklage (12, 42), einer im wesentlichen flüssigkeitsundurchlässigen Bodenlage (13, 43) und einem zwischen den Lagen eingeschlossenen absorbierenden Körper, **dadurch gekennzeichnet, dass** der absorbierende Körper eine absorbierende Struktur (11, 41) nach einem der Ansprüche 4-10 enthält.

12. Absorbierende Artikel nach Anspruch 11, in dem der absorbierende Körper zumindest zwei Schichten enthält, eine Aufnahmeschicht (14) und eine oder mehrere Saug- und/oder Speicherschichten (15, 16), wobei die Aufnahmeschicht (14) dazu bestimmt ist, eine Flüssigkeit schnell aufzunehmen und zur Saug- (15) und/oder Speicherschicht (16) oder -schichten zuzuführen, **dadurch gekennzeichnet, dass** die Aufnahmeschicht (14) eine absorbierende Struktur (11, 41) nach Anspruch 4 umfasst.

13. Absorbierender Artikel nach Anspruch 12, **dadurch gekennzeichnet, dass** die Zellulosefasern in der Aufnahmeschicht (14) hauptsächlich aus Fasern aus chemithermomechanisch hergestelltem Zellstoff bestehen.

14. Absorbierender Artikel nach Anspruch 13, **dadurch gekennzeichnet, dass** die absorbierende Struktur (11, 41) in der Aufnahmeschicht (14) auf einer Seite hiervon mit einer Schicht aus chemischem Zellstoff bedeckt ist.

15. Absorbierender Artikel nach einem der Ansprüche 12-14, **dadurch gekennzeichnet, dass** wenigstens ein Teil der Zellulosefasern in der Aufnahmeschicht (14) chemisch versteifte Zellulosefasern sind.

16. Absorbierender Artikel nach einem der Ansprüche 12-15, **dadurch gekennzeichnet, dass** die Dichte der Aufnahmeschicht (14) zwischen 0,25-0,70 g/cm^3, vorzugsweise zwischen 0,30-0,60 g/cm^3 beträgt.

17. Verwendung in absorbierenden Strukturen (11, 41), die in absorbierenden Artikeln eingegleidert sind, wie beispielsweise Windeln, Hygienebinden, Tampons, Höschenschutze, Inkontinenzschutze, Bettenschutze, Wundverbände, Speichelabsorbens und ähnliche Artikel, von einer aus Partikelmaterial trockengeformten Bahn (14, 15, 16, 41) mit 30-100%, vorzugsweise wenigstens 50% und am bevorzugsten wenigstens 70% Zellulosefasern, die auf eine Bahndichte von 0,2-0,8 g/cm^3 zusammengedrückt ist, **dadurch gekennzeichnet, dass** die verwendeten Zellulosefasern schnellgetrocknet wurden und dass die Bahn zu einer Bahn mit einem Flächengewicht zwischen 50-1500 g/m^2 ohne nachfolgende Defibration und Fluffen (fluffing) trokkengeformt wurde.

Revendications

1. Procédé pour fabriquer une structure absorbante (11, 41) dans un article absorbant tel qu'une couche-culotte, une protection hygiénique, un tampon périodique, un protège-slip, une protection contre l'incontinence, une alèse, un pansement ou compresse, un absorbant de salive et autres articles, dans lequel un matériau particulaire comprenant de 30 à 100 %, de préférence au moins 50 %, et mieux

encore au moins 70 % de fibres de cellulose, est formé à sec en une nappe (14, 15, 16, 41) qui est comprimée jusqu'à obtenir une masse volumique de nappe allant de 0,2 à 0,8 g/cm^3, caractérisé en ce que les fibres de cellulose utilisées ont été séchées instantanément ; la nappe (14, 15, 16, 41) est formée à sec jusqu'à obtenir une nappe présentant une masse surfacique de 50 à 1500 g/m^2 ; et en ce que l'on incorpore la nappe sans défibrage et formation de fluff ultérieurs, en tant que structure absorbante dans un article absorbant.

2. Procédé pour fabriquer une structure absorbante (11, 41) selon la revendication 1, caractérisé en ce que ladite nappe (14, 15, 16, 41) est comprimée jusqu'à obtenir une masse volumique de nappe allant de 0,25 à 0,70 g/cm^3, de préférence de 0,3 à 0,6 g/cm^3.

3. Procédé pour fabriquer une structure absorbante (11, 41) selon l'une quelconque des précédentes revendications, caractérisé en ce que la nappe (14, 15, 16, 41), avant d'être incorporée en tant que structure absorbante dans un article absorbant, est soumise à un ramollissement mécanique et un délaminage associé de manière à présenter plusieurs couches minces fibreuses partiellement séparées (62) qui présentent en elles-mêmes une masse volumique correspondant à la masse volumique de nappe.

4. Structure absorbante (11, 41) destinée à un article absorbant tel qu'une couche-culotte, une serviette hygiénique, un tampon périodique, un protège-slip, une protection contre l'incontinence, une alèse, un pansement ou compresse, un absorbant de salive et autres articles, la structure ayant été fabriquée selon le procédé revendiqué dans une ou plusieurs des revendications 1 à 3, et comprenant un matériau particulaire contenant de 30 à 100 %, de préférence au moins 50 % et mieux encore, au moins 70 % de fibres de cellulose, formée à sec en une nappe (14, 15, 16, 41) qui est comprimée jusqu'à obtenir une masse volumique de nappe allant de 0,2 à 0,8 g/cm^3, caractérisée en ce que les fibres de cellulose utilisées ont été séchées instantanément, et en ce que la nappe est formée à sec jusqu'à obtenir une nappe présentant une masse surfacique de 50 à 1500 g/m^2, et est comprimée sans de quelconques défibrage et formation de fluff ultérieurs.

5. Structure absorbante (11, 41) selon la revendication 4, caractérisée en ce que la masse surfacique de la structure (11, 41) va de 80 à 1000 g/m^2, de préférence de 100 à 800 g/m^2.

6. Structure absorbante (11, 41) selon la revendication 4 ou 5, caractérisée en ce que les fibres de cellulose sont principalement constituées de fibres de pâte produite par voie chimico-thermomécanique.

7. Structure absorbante (11, 41) selon la revendication 6, caractérisée en ce que les fibres de pâte chimico-thermomécanique présente une valeur de frisure de 0,20 à 0,40.

8. Structure absorbante (11, 41) selon l'une quelconque des revendications 4 à 7, caractérisée en ce qu'au moins une partie des fibres sont des fibres de cellulose chimiquement rigidifiées.

9. Structure absorbante (11, 41) selon l'une quelconque des revendications 4 à 8, caractérisée en ce qu'elle comporte de 0 à 20 % de matériau superabsorbant, de préférence de 0,5 à 10 % et au mieux de 1 à 5 %, le pourcentage étant calculé par rapport au poids total de la structure à l'état sec.

10. Structure absorbante (11, 41) selon l'une quelconque des revendications 4 à 9, caractérisée en ce qu'elle comporte un agent de renforcement, par exemple, un agent liant, des fibres de renforcement ou des fibres liantes thermoplastiques.

11. Article absorbant tel qu'une couche-culotte, une serviette hygiénique, un protège-slip, une protection contre l'incontinence, une alèse, un pansement ou compresse, un absorbant de salive et autres articles, comprenant une feuille supérieure perméable aux liquides (12, 42), une feuille inférieure essentiellement imperméable aux liquides (13, 43) et un corps absorbant compris entre lesdites feuilles, caractérisé en ce que le corps absorbant comprend une structure absorbante (11, 41) selon l'une quelconque des revendications 4 à 10.

12. Article absorbant selon la revendication 11, dans lequel le corps absorbant comporte au moins deux couches, une couche de réception (14) et une ou plusieurs couches formant mèche et/ou de stockage (15, 16), dans lequel la couche de réception (14) est destinée à capter et distribuer rapidement le fluide vers la ou les couche(s) formant mèche (15) et/ou de stockage (16), caractérisé en ce que la couche de réception (14) comprend une structure absorbante (11, 41) selon la revendication 4.

13. Article absorbant selon la revendication 12, caractérisé en ce que les fibres de cellulose dans la couche de réception (14) sont principalement constituées de fibres de pâte produite par voie chimico-thermomécanique.

14. Article absorbant selon la revendication 13, caractérisé en ce que la structure absorbante (11, 41)

dans la couche de réception (14) est recouverte d'une couche de pâte chimique sur l'une de ses faces.

15. Article absorbant selon l'une quelconque des revendications 12 à 14, caractérisé en ce qu'au moins une partie des fibres de cellulose dans la couche de réception (14) sont des fibres de cellulose chimiquement rigidifiées.

16. Article absorbant selon l'une quelconque des revendications 12 à 15, caractérisé ence que la masse volumique de la couche de réception (14) va de 0,25 à 0,70 g/cm^3, de préférence de 0,30 à 0,60 g/cm^3.

17. Utilisation, dans des structures absorbantes (11, 41) incorporées dans des articles absorbants tels que des couches-culottes, des protections hygiéniques, des tampons périodiques, des protège-slips, des protections contre l'incontinence, des alèses, des pansements ou compresses, des absorbants de salive et autres articles, d'une nappe (14, 15, 16, 41) formée à sec d'un matériau particulaire comprenant de 30 à 100 %, de préférence au moins 50 % et mieux encore, au moins 70 % de fibres de cellulose, et comprimée jusqu'à obtenir une masse volumique de nappe de 0,2 à 0,8 g/cm^3, caractérisée en ce que les fibres de cellulose utilisées ont été séchées instantanément ; et en ce que la nappe est formée à sec jusqu'à obtenir une nappe présentant une masse surfacique de 50 à 1500 g/m^2, sans de quelconques défibrage et formation de fluff ultérieurs de la nappe.

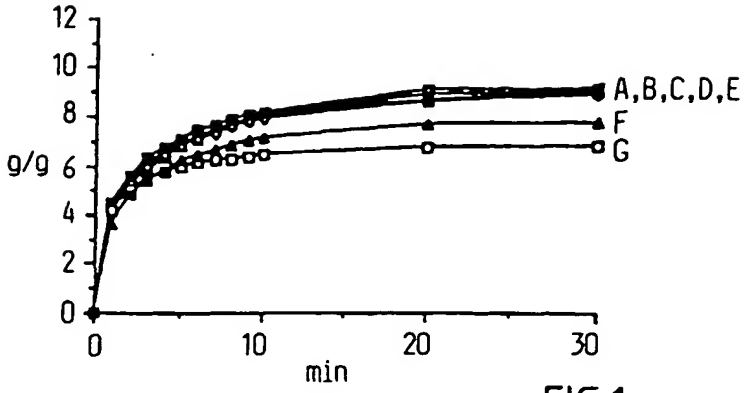

FIG.1

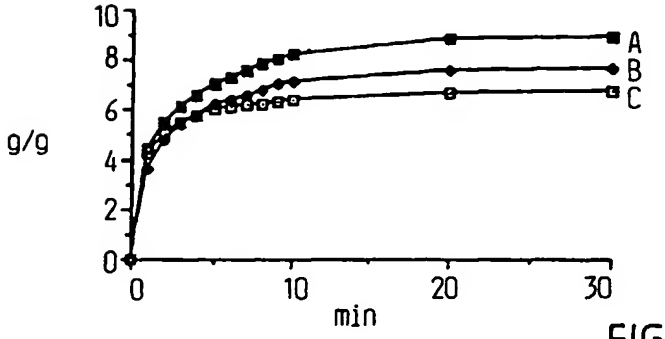

FIG.2

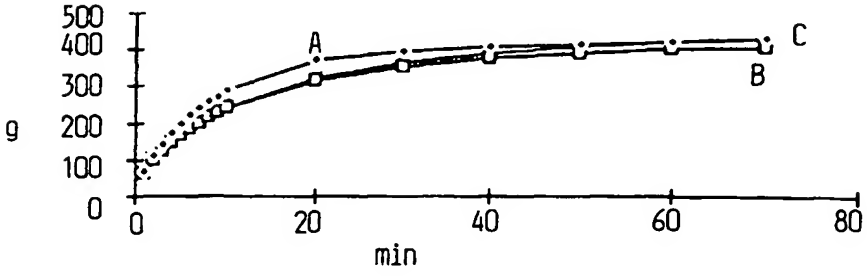

FIG.3

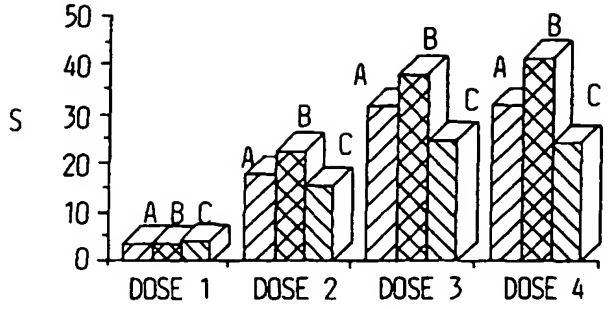

FIG. 4

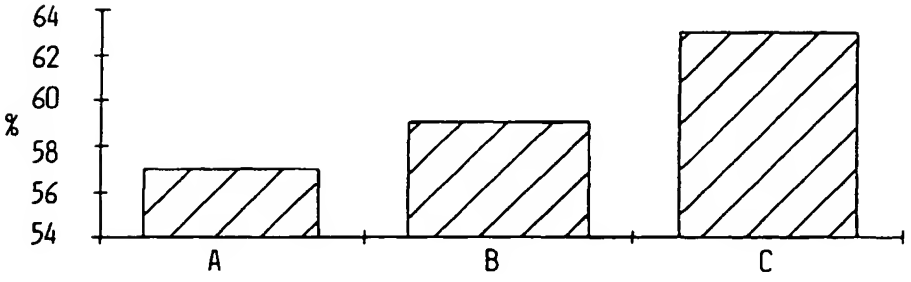

FIG. 5

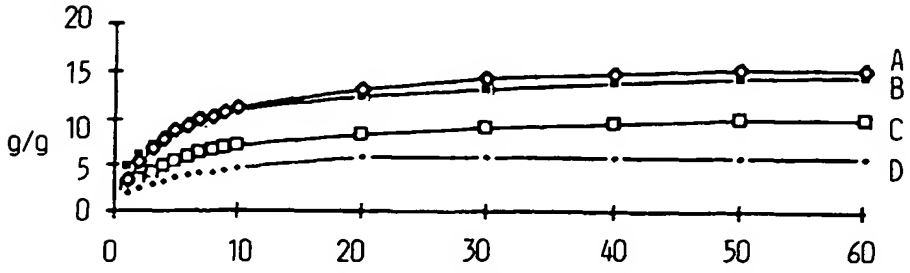

FIG. 6

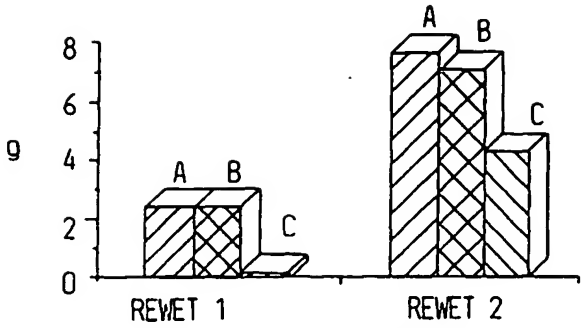

FIG.7

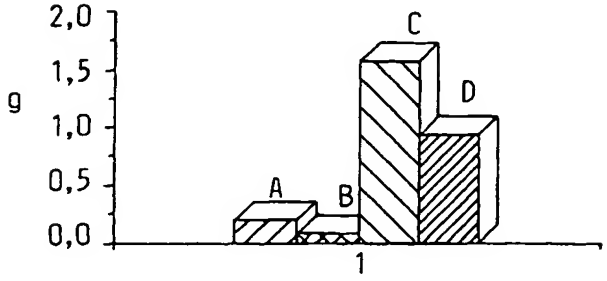

FIG.8

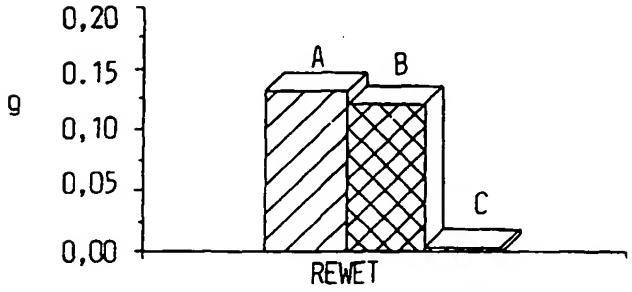

FIG.9

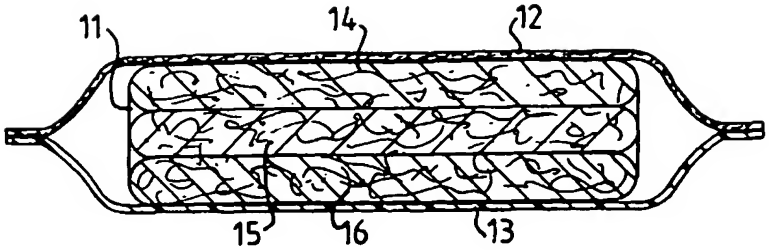

FIG. 10

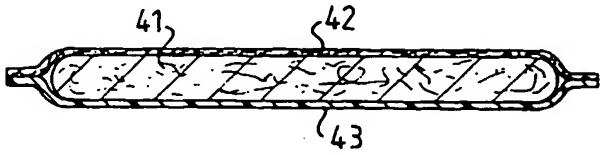

FIG.11

FIG.12

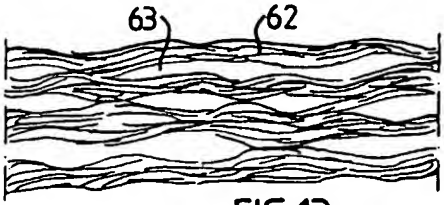

FIG.13